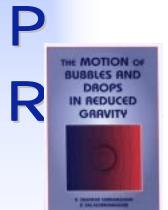
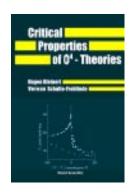
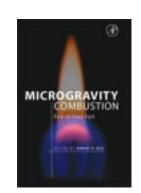


## The Physical World: OBPR Research

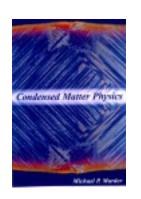


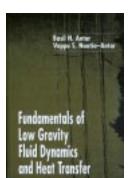


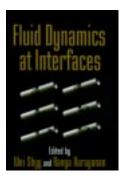














# Physical Sciences and the OBPR Organizing Questions

How can we educate and inspire the next generations to take the journey?

How can we assure the <u>survival</u> of humans traveling far from earth?

What technology must we create to <u>enable</u> the next explorers to go beyond where we have been?



**PSR Strategic Research for Exploration** 

P

**PSR Fundamental and Applied Research** 





How does life respond to gravity and space environments?

What new opportunities can our research bring to <u>expand</u> our understanding of the fundamental laws of Nature and <u>enrich</u> lives?





**Fluids** 

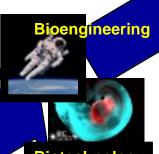
Combustion

Research for Science and **Exploration** 



"The common ideas of physics have been applied over distances ranging from the realm of string theory to the furthest reaches of the universe. The results have allowed an understanding of a staggering variety of phenomena and lay the foundation for further research as we probe new frontiers at

all distances." (NRC/BPA report)





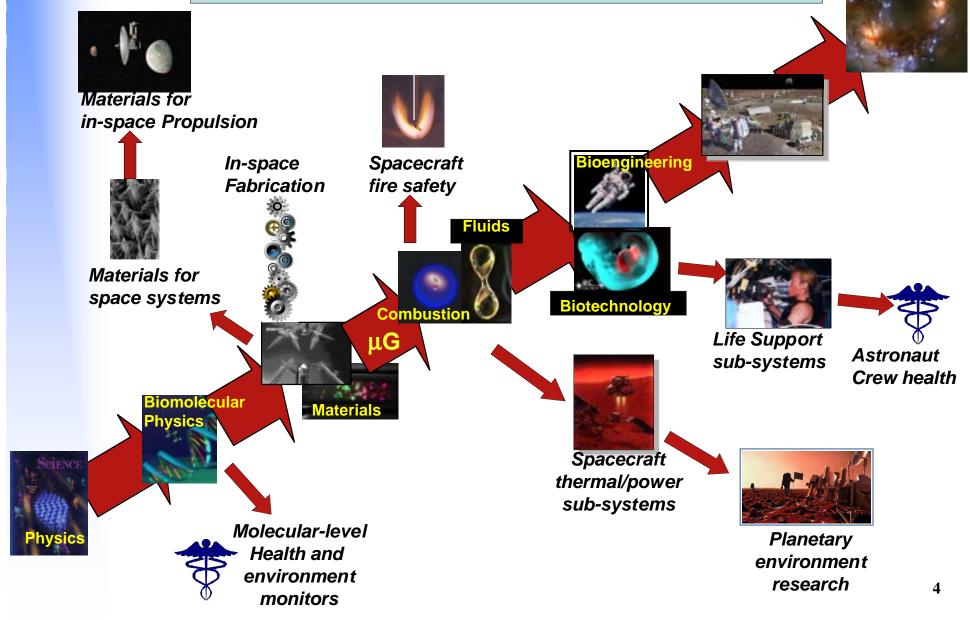


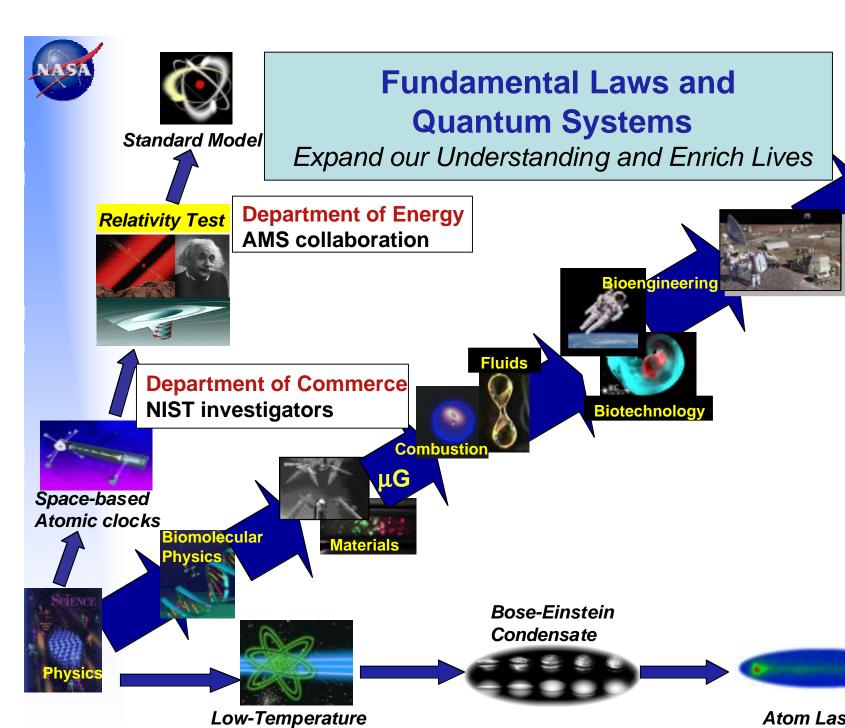
**OBPR Physical Sciences Research Discipline Elements** 



#### **Strategic Research for Exploration**

Enable the Next Explorers





**Physics** 

Atom Laser Research



#### **Complex Systems and Materials**

Expand our Understanding and Enrich Lives

Soot reduction Efficient burners Fire safety

**Industrial** processes **Advanced composites New materials** 



**Pattern Formation** Self-assembly **Computational** 

Gaseous Flames **Droplet Sprays Dust Clouds** 



Material **Processes** 

Combustion



**Materials** 

Bioengineering



Soft Condensed Matter

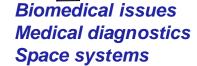


**Granular Materials Colloids** Foams and Emulsions

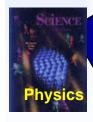
Physiological systems **Control** systems **Biomaterials & Transduction** 

**System** 

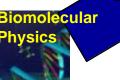
**Biology** 



Earthquake research Photonic materials **Consumer products** Biological processes









Biotechnology



### **Bioscience and Engineering**

Expand our Understanding and Enrich Lives

Combustion

Tissue Models
Mammalian tissue technology
Genomic Diagnostics
Metabolic engineering





In-space medical support
Bio-sentinel technologies
In-space Resource Utilization

Tissue engineering



Biomolecular
Physics &
Chemistry

Molecular-level Sensors
Physiological sensors
Biomolecular imaging
Biomolecular probes

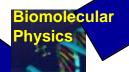




In-space Crystallization Challenging Issues Genomic Diagnostics



Biomedical applications
Human exploration support





**Materials** 

uG

Miniaturized diagnostics Medical applications Human space systems

